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FULL-TREE SKIDDING BLACK SPRUCE: ANOTHER WAY TO FAVOR REPRODUCTION

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ABSTRACT.--An alternative to burning is needed for clearcut peatlands where only slash disposal is required to rapidly reproduce black spruce. A 2-year trial in north-central Minnesota indicates that reproduction will be rapid after full-tree skidding on nonbrushy sites that have well-distributed sphagnum seedbeds and ample natural seeding. Broadcast burning is still recommended for most other conditions. The overall cost of slash disposal should be less by skidding than by burning if most trees are merchantable.

OXFORD: 231.3:372:174.7(776)*Picea mariana*.
KEY WORDS: *Picea mariana*, mechanized harvesting, site preparation, slash disposal, broadcast burning.

Site preparation is usually required to rapidly reproduce black spruce (*Picea mariana* (Mill.) B. S. P.) on clearcut peatlands. Under proper conditions, broadcast burning is particularly effective because it can simultaneously consume most slash, improve seedbeds, reduce brush, kill unmerchantable trees, and control dwarf mistletoe (*Arceuthobium pusillum* Peck).[1] [2]

However, many forest managers are inexperienced with broadcast burning and hesitate to use it. Further, suitable weather is sporadic and cannot be forecast very far ahead, so burning often must be scheduled on short notice.

Therefore, an alternative is needed for the large acreage where slash is expected to be the only important hindrance to satisfactory reproduction. Progressive burning of piled slash in winter is effective but much more costly than broadcast burning.[1] Hence, full-tree skidding was tried in Minnesota as another method of slash disposal. Establishment of naturally seeded black spruce after 2 years indicates that full-tree skidding will be effective if carefully applied under certain peatland conditions.

PROCEDURE

The trial was made in a black spruce stand on a medium-site peatland near Big Falls in north-central Minnesota.[3] The area had well-distributed sphagnum moss (*Sphagnum* spp.)--a good seedbed, no brush, few unmerchantable trees, and no dwarf mistletoe. Hence, the only site preparation needed was slash disposal to keep sphagnum seedbeds exposed. So full-tree

[1] *William F. Johnston. Broadcast burning slash favors black spruce reproduction on organic soil in Minnesota. For. Chron. 47:33-35. 1971.*

[2] *William F. Johnston. Management guide for the black spruce type in the Lake States. USDA For. Serv. Res. Pap. NC-64, 12 p. North Cent. For. Exp. Stn., St. Paul, Minn. 1971.*

[3] *The cooperation of the Minnesota Department of Natural Resources, Division of Forestry, is gratefully acknowledged.*

skidding was expected to be as effective as burning *provided that trees could be removed with branches and tops intact.*

Harvesting was done in January and February to test full-tree skidding when branches and tops are brittle and likely to break off. The average monthly temperature was -3° and +4° F, respectively. Trees 2 inches d.b.h. and larger were felled and those 3 inches d.b.h. and larger were pulled to a landing as whole trees by a rubber-tired skidder (fig. 1). Instead of intentionally knocking off branches as is often done during skidding, the logger was instructed to fell and skid the trees carefully to minimize breakage. At the landing the skidded trees were processed and unmerchantable material was periodically pushed into a pile and burned. The harvest averaged 26 cords of pulpwood per acre.

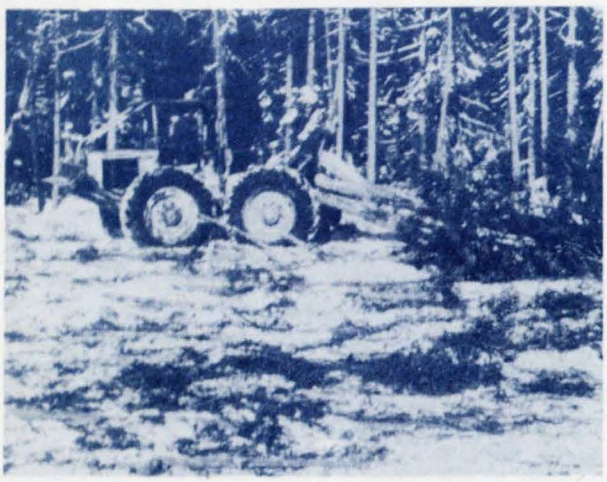

Figure 1.--*Rubber-tired skidder pulling whole black spruce trees. Relatively few branches broke off.*

Natural seeding was relied on to reproduce the area because it was a small block (330 by 530 feet) in a mature stand of black spruce. Tree seedlings were counted 2 years after harvesting on a 1/4-milacre plot in 100 well-distributed milacre quadrats. If black spruce was absent on a plot, its presence was checked on the whole quadrat to determine milacre stocking. Sphagnum seedbeds and slash seedbeds were recorded by cover class on each 1/4-milacre plot to help explain reproduction success. Slash was classified as a seedbed only where it actually composed the surface material on the ground.

RESULTS

Black spruce seedlings averaged 22,600 per acre with 92 percent milacre stocking 2 years after full-tree skidding. These results are similar to those reported earlier following broadcast and progressive burning on other nonbrushy, clearcut peatlands receiving natural seeding[1] (table 1). Quaking aspen (*Populus tremuloides* Michx.) and paper birch (*Betula papyrifera* Marsh.) also reproduced from natural seeding. These species averaged 4,900 and 800 seedlings per acre, respectively, but they are not expected to seriously reduce the growth of black spruce on this medium site.

Black spruce reproduced rapidly because full-tree skidding removed most slash (fig. 2) and thus kept sphagnum moss exposed. Slash seedbeds and sphagnum seedbeds both occurred on 90 percent of the 1/4-milacre sample plots. However, only 29 percent of the plots had more than one-fourth of the ground covered by slash seedbeds, compared with 64 percent for sphagnum seedbeds. Most black spruce seedlings occurred on these sphagnum seedbeds. The amount of sphagnum seedbeds and their importance for reproduction were similar after progressive burning on other nonbrushy, medium-site peatlands.[1] This is because slash disposal by piling and burning in scattered spots kept sphagnum moss exposed just as disposal by full-tree skidding did.

MANAGEMENT IMPLICATIONS

It is concluded that black spruce will reproduce rapidly after full-tree skidding if *all* of the following conditions occur: (1) the site is not brushy, (2) sphagnum seedbeds are well distributed, and (3) natural seeding is ample. However, forest managers are reminded that broadcast burning is still the recommended method of site preparation if *any* of the following conditions occurs: (1) the site is brushy, (2) seedbeds are mainly nonsphagnum types such as feather mosses, (3) dwarf mistletoe is present, or (4) many old, slow-growing trees will remain after harvesting.[2] Of course, if burning is planned, full-tree skidding cannot be used because the slash must be left on the harvest area to carry the fire.

In terms of practice, it should be pointed out that the reproduction success reported here probably resulted not only from suitable site conditions but also from careful felling and skidding. Practically

Table 1.--*Black spruce reproduction 2 to 6 years after various methods of slash disposal on nonbrushy, clearcut peatlands receiving natural seeding*[1]

Method	Reproduction		Basis	
	Stems per acre	Milacre stocking	Test areas sampled	Time since treatment
	Number	*Percent*	*Number*	*Years*
Full-tree skidding	22,600	92	1	2
Broadcast burning	17,600	98	2	2-4
Progressive burning	11,900	92	6	4
Control (no slash disposal)	3,000	55	6	4-6

[1] Except for full-tree skidding, all values adapted from text footnote 1.

Figure 2.--*Harvest area 2 years after full-tree skidding. Only a little slash remains.*

all trees were felled leaving stumps as low as possible to minimize obstacles that would break off branches and tops during skidding. Also, the trees were felled into the open rather than into the stand where more breakage would occur. Therefore, it is recommended that felling and full-tree skidding be done with reasonable care to ensure more complete slash removal for rapid and well-distributed reproduction.

Further, the interior of harvest areas should be within range of natural seeding.[2] However, in good seed years sufficient seed may be dispersed before and during full-tree skidding to effectively reproduce large harvest areas. In poor seed years direct seeding may be needed on large areas. But these alternatives cannot be recommended until they have been tested.

Personal observations and those of other foresters in Minnesota indicate that the cost of slash disposal by skidding depends largely on the logger's skill and on how many unmerchantable trees must be removed. Most loggers are sufficiently skilled at full-tree skidding that its use for harvesting merchantable trees does not justify extra compensation. The processing observed at the landing was more efficient and resulted in more complete utilization than the processing that is usually done where broadcast burning is planned. However, the logger should be compensated for removing unmerchantable trees, especially if they are relatively abundant. It is concluded that the overall cost of slash disposal will be less by skidding than by burning if most trees are merchantable. Skidding should be particularly advantageous on small areas because they have the highest burning cost per acre.

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